

THAT WHICH IS CLAIMED IS:

1. An antenna subassembly comprising an integrated antenna and
5 acoustic channel having a resonant frequency of operation, comprising:
an acoustic channel formed of substrate material, the acoustic channel having
a wall with an enclosed space and an associated length and width, the acoustic
channel adapted, during operation, to guide the output of a speaker to a target
location; and
10 an antenna that is integrated with the acoustic channel.
2. An antenna subassembly according to Claim 1, wherein the acoustic
channel is formed of a substrate material that is non-conductive, and wherein the
antenna comprises a conductive element is formed on and/or in a portion of the wall
15 of the acoustic channel.
3. An antenna subassembly according to Claim 1, wherein the acoustic
channel is formed of a substrate material that is non-conductive, and wherein the
antenna comprises a dielectric resonant antenna comprising a dielectric block element
20 that is formed on and/or on a portion of the wall of the acoustic channel.
4. An antenna subassembly according to Claim 1, further comprising a
speaker in communication with the acoustic channel.
- 25 5. An antenna subassembly according to Claim 2, wherein at least a
portion of the conductive element is conformal to the shape of a portion of the
acoustic channel wall.
6. An antenna subassembly according to Claim 2, wherein the conductive
30 element is a planar inverted F-antenna.

7. An antenna subassembly according to Claim 6, wherein the antenna conductive element has an antenna length of about $\frac{1}{4}$ wavelength at a selected frequency and/or frequency bandwidth.

5 8. An antenna subassembly according to Claim 6, wherein the antenna is configured to resonate at a selected frequency band that is about 1570MHz to thereby provide GPS capability.

10 9. An antenna subassembly according to Claim 2, further comprising a signal and ground feed configured to exit the acoustic channel and engage with the printed circuit board, wherein the ground and signal feeds are positioned adjacent each other proximate a common side of the acoustic channel, wherein the acoustic channel has opposing first and second end portions, and wherein the antenna conductive element is positioned closer to the first end portion of the acoustic channel
15 with the speaker in communication with the second end portion of the acoustic channel.

20 10. An antenna subassembly according to Claim 9, wherein at least a portion of the antenna conductive element is formed directly onto the substrate of the acoustic channel.

11. A wireless terminal, comprising:
(a) a housing configured to enclose a transceiver that transmits and receives wireless communications signals;
25 (b) an acoustic channel having a wall with an enclosed space and an associated length and width with opposing first and second end portions;
(c) an antenna having an associated radiating element, wherein at least a portion of the element is in and/or on the acoustic channel; and
(d) a speaker in communication with the acoustic channel, the acoustic
30 channel adapted, during operation, to guide the output of the speaker to a desired location in the housing.

12. A wireless terminal according to Claim 11, wherein the antenna has a conductive radiating element and is configured as a planar inverted F-antenna, wherein the antenna has an electrical length that is about a quarter wavelength, and wherein the speaker is positioned below the antenna.

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13. A wireless terminal according to Claim 12, wherein at least a portion of the antenna has a shape that substantially corresponds to a portion of the acoustic channel cavity shape.

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14. A wireless terminal according to Claim 11, wherein the antenna is configured as a dielectric resonating antenna with a dielectric radiating element, and wherein the speaker is positioned below the antenna.

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15. A wireless terminal according to Claim 14, wherein at least a portion of the antenna has a shape that substantially corresponds to a portion of the acoustic channel cavity shape.

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16. A wireless terminal according to Claim 12, further comprising a printed circuit board disposed within the housing with an acoustic channel aperture formed therein and having a signal feed and ground plane, wherein the antenna is operatively associated with the signal feed and ground plane, and wherein the antenna element in the acoustic channel defines a secondary antenna operating at a selected frequency, said wireless terminal further comprising a separate primary antenna spaced apart from the secondary antenna.

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17. A wireless terminal according to Claim 14, further comprising a printed circuit board disposed within the housing with an acoustic channel aperture formed therein and having a signal feed, wherein the antenna is operatively associated with the signal feed, and wherein the antenna in the acoustic channel defines a secondary antenna operating at a selected frequency, said wireless terminal further comprising a separate primary antenna spaced apart from the secondary antenna.

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18. A wireless terminal according to Claim 16, wherein the primary antenna is a planar inverted F-antenna having a plurality of resonant bandwidths that are different that the resonant bandwidth of the secondary antenna and is in communication with the signal feed and ground plane of the printed circuit board.

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19. A wireless terminal according to Claim 16, further comprising an antenna cavity positioned on a rear upper portion of the housing overlying and encasing the primary antenna and the acoustic channel with the secondary antenna therein.

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20. A wireless terminal according to Claim 19, wherein the acoustic channel is formed of a non-conductive substrate material, and wherein at least a portion of the secondary antenna element is disposed on a portion of the inner surface of the acoustic channel so that the secondary antenna element defines about a $\frac{1}{4}$ wave resonator at a selected frequency of operation.

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21. A wireless terminal according to Claim 11, wherein the channel has a center portion that is an air gap, and wherein the antenna element has a major portion that is substantially planar and an edge portion that extends above or below the planar portion, and wherein at least a portion of the antenna element conforms to the shape of the acoustic channel.

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22. A wireless terminal with two discrete internal antennas for multi-band operation, comprising:

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(a) a housing having opposing forward and rear portions, the housing configured to hold a transceiver that transmits and receives wireless communications signals;

(b) an acoustic channel having a wall and an associated length and width, the acoustic channel positioned in the housing;

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(c) an antenna cavity disposed on the rear portion of the housing and positioned to overlie and enclose the acoustic channel;

(d) a secondary antenna at least a portion of which is positioned in and/or on the acoustic channel and electrically connected with the transceiver;

(e) a primary planar inverted F-antenna having a conductive element positioned in the housing antenna cavity and electrically connected with the transceiver; and

5 (f) a speaker in communication with the acoustic channel, the acoustic channel adapted, during operation, to guide the output of the speaker to the forward portion of the housing.

23. A wireless terminal according to Claim 22, wherein the secondary antenna comprises a planar inverted F-antenna having a conductive element with at
10 least a portion of the conductive element positioned in and/or on the acoustic channel and electrically connected with the transceiver.

24. A wireless terminal according to Claim 23, wherein the speaker is positioned below the secondary antenna, and wherein the secondary antenna
15 conductive element is held encased by the acoustic channel and is configured so that at least a portion of the secondary antenna conductive element substantially conforms to the interior shape of the channel and allows acoustic transmission of the speaker to exit the acoustic channel.

20 25. A wireless terminal according to Claim 22, wherein the secondary antenna comprises a dielectric resonator antenna having a dielectric block element with at least a portion of the element positioned in and/or on the acoustic channel and electrically connected with the transceiver.

25 26. A wireless terminal according to Claim 25, wherein the speaker is positioned below the secondary antenna, and wherein the secondary antenna element is held encased by the acoustic channel and is configured so that at least a portion of the secondary antenna element substantially conforms to the interior shape of the channel and allows acoustic transmission of the speaker to exit the acoustic channel.

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27. A method of operating a wireless terminal, comprising:
transmitting sound from a speaker in the wireless terminal to outside the wireless terminal via an acoustic channel that comprises an integrated antenna.